

REMARKS

The Office Action dated January 2, 2004, has been reviewed and carefully noted. The preceding amendments and the following remarks are submitted as a full and complete response thereto. Claims 1 and 22 have been amended. Claims 26-27 have been added. Support for the amended and new claims can be found at paragraphs 0017 through 0023 of the present specification. No new matter has been added. Accordingly, claims 1-20 and 22-27 are pending in this application and are submitted for consideration.

- Claims 1, 2, 4-6, 8-12 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. patent no. 6,174,820 to Habermehl et al. ("Habermehl");
- Claims 22-25 were rejected under 35 U.S.C 102(b) as being anticipated by U.S. Patent No. 5,798,283 to Montague et al. ("Montague");
- Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over Habermehl;
- Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over Habermehl in view of U.S. patent No. 6,534, 413 to Robertson, III et al. ("Robertson");
- Claim 13 was rejected under 35 U.S.C §103(a) as being unpatentable over Habermehl in view of U.S. published application 2003/001251 to

Cheever et al. ("Cheever");

- Claim 14 was rejected under 35 U.S.C §103(a) as being unpatentable over Habermehl in view of U.S. published application 2002/0181725 to Johannsen et al. ("Johannsen");
- Claims 15 and 19 were rejected under 35 U.S.C §103(a) as being unpatentable over Habermehl in view of U.S. published application 2002/0096421 to Cohn et al. ("Cohn");

All of the rejected claims were rejected over the primary reference of Habermehl, except for claims 22-25, which were rejected solely over Montague.

Habermehl describes an MEM structure and method of fabricating the structure, wherein the structure is formed in a cavity of substrate and not on the surface of a substrate. In the Office Action, the Examiner referred to Figs. 5a to 5q to support the rejections. Therein, Habermehl describes and shows a number of sacrificial layers being deposited and etched, and then a number of doped polysilicon layers are deposited in between the sacrificial layers in order to form an MEM structure having a top electrode 12, a bottom electrode 12, and a movable member 10 that is supported by two pillars (22, 32, 36, 38), and which is suspended between the two electrodes. This process includes depositing at least five sacrificial layers into the cavity and over substrate. After all five sacrificial layers are deposited, the entire substrate is planarized down to a flat nitride layer of 64. Only after the substrate is planarized, then a layer of

silicon nitride 72 is later deposited over the entire substrate. After the MEMS device is fabricated into the cavity, circuitry is deposited onto the surface of the substrate during a number of fabrication steps connecting transistors to the MEMS device. After additional electronic circuitry is deposited, openings 92 are etched into the silicon nitride layer 70, and the plurality of sacrificial layers are then removed. After the sacrificial layers are removed, the channels 92 can be plugged from a sealed-cavity with silicon nitrate plugs 94 or with an evaporated metal. See column 16, lines 48-52.

Habermehl shows and describes an encapsulating layer of silicon nitride being deposited over the plurality of sacrificial layers after planarization. However, there is no step of coating the second sacrificial layer with a first film having tapered sides as required by independent claim 1 of the present invention. For example, see Fig. 9 of the present application.

The MEMS device of Habermehl is formed in a cavity or well, and the only layers which could be considered to seal the MEMS device in the cavity is a flat layer of silicon nitride (72) covering the entire cavity opening, and the device of Habermehl is quite different from the configuration of the claimed invention. Thus, Habermehl fails to show, describe or suggest each and every element of claim 1, upon which claims 2-15 depend. None of the cited prior art makes up for this noted deficiency in Habermehl. Accordingly, the Applicant requests that the rejection be withdrawn and claims 1-15 be allowed.

Regarding the rejection of claims 22-25, independent claim 22 requires the step of forming a moving member above the actuating element by applying a first sacrificial layer over the actuating element, and depositing conductive metal such that the material extends from the control circuit to cover the first sacrificial layer. Montague shows support beams 26 that are formed in a gap in the sacrificial layer and overlap only a small portion of the sacrificial layer, and certainly do not cover the layer. The support beams are described as being fixed support beams. See column 6, lines 8-23 of Montague. Montague describes a three-layer process that is advantageous for mechanical interconnecting elements of a MEM device 12. The additional polysilicon layers may be deposited, at least in part, through one or more patterned sacrificial layers at 30 for defining a shape of the MEM elements, and for performing anchor portions for mechanical and electrical connections to the first-deposited polycilicon layer 24. Montague does not teach a step of forming a moving member above the actuating element by a applying a first sacrificial layer over the actuating element, depositing conductive material such that it extends from the control circuit to cover the first sacrificial layer, and removing portions of the sacrificial layer around the moving member but not between the moving member and the substrate, as required by claim 22.

Moreover, claim 22 fo the present application requires that the second sacrificial layer be coated with a material that forms a hermetic seal with the substrate having

tapered sides. Montague, like Habermehl, describes a MEMS device formed in a cavity or well in a substrate. The only layers which could be considered to seal the MEMS device in the cavity are flat layers covering the entire cavity opening, and are quite different from the configuration of the claimed invention. In fact, since the MEMS device is formed in a well, there would be no reason to add tapered sides to any hermetic sealing layer. Thus, Montague fails to show or describe each and every element of claims 22-25. Accordingly, the Applicant requests that the rejection be withdrawn and claims 22-25 be allowed.


New claims 26 and 27 correspond to claims 1 and 22 respectively, except that these claims are limited to forming a MEMS device on a flat surface of a substrate. In contrast, Habermehl and Montague, the two principal references used to support the current rejections, are both directed to MEMS devices formed in a cavity form in a substrate. The MEMS devices of Habermehl and Montague are formed before the circuitry is formed on the substrate and is formed quite differently from the MEMS device of present invention, which is formed on top of the substrate. Thus, the Applicants submit that no combination of the cited prior art discloses or suggests all the limitations of claims 26 and 27.

In view of the above remarks, Applicant respectfully submits that each of claims 1-20 and 22-27 recite subject matter which is neither disclosed nor suggested in the cited prior art. Applicant submits that this subject matter would not have been

obvious to a person of ordinary skill in the art. Applicant therefore requests that each of claims 1-20 and 22-27 be reconsidered in view of the above discussion, and that this application be allowed.

If for any reason the Examiner feels that the application still is not in condition for allowance, the Examiner is requested to contact, by telephone, the Applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event that this paper is not timely filled, the Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account No. 02-2135.

<input checked="" type="checkbox"/> Customer Number or Bar Code Label 6449					
Name	Brian A. Tollefson, Reg. No. 46,338				
Signature				Date	4/2/04
Address	Rothwell, Figg, Ernst & Manbeck Suite 800, 1425 K Street, N.W.				
City	Washington	State	D.C.	Zip Code	20005
Country	U.S.A.	Telephone	202-783-6040	Fax	202-783-6031